

SESSION I
AFFIRMATIVE PROCUREMENT/GREEN CONSTRUCTION

SESSION CHAIRPERSONS:

Ms. Karen Kivela, HQ AFCEE/EQP
Mr. Wayne Kachel, MELE Associates

Sustainable "Green" Construction

Cadet Kathleen M. Burke, USAFA

Major Blair A. Schantz, US Army

(719) 333-4217

burkekm99@cs23@usafa.af.mil

schantzba.dfce@usafa.af.mil

Sustainable construction with the environment. In 1789 belongs to each . . . generation own right, no generation can paid during the course of its own realized the importance of what we construction," but over two hundred sustainable future have only just begun. For an environment to live off its interest rather than consuming its capital, recognizing and capitalizing on the interdependence of economic and environmental resources is necessary. In order to recognize and apply this interdependency it is important to be familiar with the sustainable construction program, the constraints for its implementation and the resources available to incorporate sustainable construction into the overall construction process.



encompasses people's relationships Thomas Jefferson said " the earth during its course, fully and in its contract debts greater than may be existence." Jefferson clearly refer to today as "sustainable years later, movement towards a

Sustainable Construction Program

Long-term economic and social benefits are derived from environmentally friendly construction practices. There are notable benefits to be gained from building "green." Sustainable buildings are enhanced by their natural environment. For example, the Green Neighborhood project at Fort Hood Army Installation, TX, integrated housing within the natural habitat. Trees and shrubs were strategically planted around houses to reduce solar gain in hot weather. Using vegetative cooling techniques cut energy bills and improved indoor and outdoor comfort for residents. Studies show that another benefit of sustainable construction is the increased efficiency of employees. The Rocky Mountain Institute reports that people working in sustainable buildings are 15 percent more productive than people working in "traditionally" constructed buildings (Browning). In a financially dependent society, increasing productivity is important to every company. This shows that "green" buildings can provide a competitive advantage.

The design, construction and maintenance of the 81 million buildings in the U.S. today have a tremendous impact on the environment and its resources. According to published reports, facilities in the United States use 17% of the total freshwater flows and 25% of harvested wood; are responsible for 50% of chlorofluorocarbon (CFC) production; use 40% of the total energy

flows; and generate 40% of landfill material from construction waste (Roodman). Sustainable construction practices often overlook the interrelationships between the building, its surroundings and its inhabitants. Sustainable building practices act upon these interrelationships in order to reasonably and efficiently use natural resources. This is done by considering the building, its surroundings, and its inhabitants in every aspect of design and construction. Smart building practices can minimize pollution and energy loss while maximizing the health, safety and comfort of the building's inhabitants. According to the Report of the National Commission on the Environment, "sustainable development does not mean leaving all of nature cordoned off and untouchable, just as it does not mean developing every acre." Responsible stewardship offers a great opportunity to create environmentally sound and efficient buildings by using an integrated approach to design. However, it is important to implement sustainable construction into the design phase of construction for it to be executed in the construction phase. Applying this early approach increases the chances and options for sustainable construction in the execution phase.

Sustainable construction must be included in all phases of a building's life. In order to increase the availability and implementation of sustainable construction practices, companies and the public can encourage architects and engineers to create more environmentally friendly building techniques. Implementing sustainable construction is a team effort that requires commitment to a "green" design from the start. This requires goals agreed upon by the architect-engineer (A/E) and the customer. Just as a football team has a common goal when entering a game, the project team must determine a common goal when entering into a contract to ensure a commitment to sustainable construction. This goal may involve appropriate sustainable construction ideas without jeopardizing budgeting considerations. In other words, finding an appropriate balance between the A/E and the customer in terms of sustainable construction parameters like cost, quality, and time. Sustainability goals may include the use of efficient resources, raw material minimization, or a process such as building siting or xeriscaping. An additional consideration may be to build facilities of long-term value while creating a healthy working environment for all that use the facility.

Constraints

Monetary and time investment, both real and perceived, can minimize the architect / engineer and customer's commitment to the implementation of sustainable construction initiatives. In terms of cost, it is important to recognize that economic and environmental realities may clash. With long term goals, proper planning, and attention to newly developed products, sustainable construction can be economically feasible. Mixing traditional regulatory policies with reinforced market incentives can also resolve the tension between economic goals and environmental realities. Environmental Executive Orders help to create markets for products. The creation of markets by the Government makes products more affordable to the public as well. Recycled office paper is the perfect example. Before the Government mandated recycled paper it was priced higher than non-recycled paper. Today, the prices are competitive. For the currently designated EPA guideline items, which include but are not limited to concrete and cement containing fly ash, recycled paper products, and insulation containing recovered materials, Federal Agencies must ensure that the products they purchase meet or exceed the EPA guideline standards. According to Executive Order #12873, concerning recycling and waste prevention, "in developing plans, drawings, work statements, specifications, or other product

descriptions, Agencies shall consider the following factors: elimination of virgin material requirements; use of recovered material; reuse of products; life cycle cost. . . . These factors should be considered in acquisition planning for all procurements and in the evaluation and award of contracts, as appropriate" (Section 401). This encourages the A/E and their customer to consider the environment in its goals from the outset of a project. The Department of Defense (DoD) requires the consideration of sustainability practices of a contractor before awarding a contract. According to Federal Acquisition Regulation (FAR) 36.601-3, for facility design contracts, the statement of work requires that the architect-engineer, in the design specifications, use the maximum practical amounts of recovered materials. The FAR continues, stressing the importance of energy conservation, pollution prevention, and waste reduction considerations. According to FAR 36.602-1, one of the evaluation parameters for construction and architect-engineer contracts is experience in sustainable practices. The importance of sustainable construction to a specific project is emphasized by how heavily it is considered in the A/E selection criteria. This is a step in the right direction in terms of DoD leadership in promoting green construction.

The cost benefits of sustainable construction are usually seen in the long term. For example, at Vandenberg AFB in California, family housing units were constructed with color coated stucco in order to avoid future painting costs and the air emission and solid waste associated with it. Another example is the use of cement roof tiles, which have a 100-year life expectancy. Although these sustainable practices increase capital costs, long-term operation and maintenance savings outweigh the short-term costs.

These examples highlight the need for life cycle cost analysis in project planning. Life cycle cost is the "amortized annual cost of a product, including capital costs, installation cost, operating costs, maintenance costs and disposal costs discounted over the lifetime of the product" (Executive Order 12873). For example, if you went to buy a new refrigerator and found one costing \$600 and another costing \$550, your initial reaction might be to purchase the less expensive model and save \$50. By reading the EnergyGuide label, you may find that the more expensive model costs less to operate, making it less expensive in the long run. Life cycle cost analysis answers the cost benefit question based on the life of the refrigerator.

This cradle-to-grave philosophy can be a problem, however, with the current Federal budget system that separates capital costs from operation and management costs. The current system appears to reward projects that minimize capital costs, while not considering operation and maintenance costs. Studies show that, over the 30-year life cycle of an average building, three times as much money is spent on operations and maintenance as on the building's initial cost (HOK). Along with this, EPA research shows that building construction, operation, and demolition accounts for 42 percent of energy use in the U.S and 30 percent of raw material consumption. This illustrates that the design decisions and materials impact the building for its entire life cycle. The DoD is exploring ways to use creative funding for innovative "green" ideas. This involves using Life Cycle Cost Assessment in order to justify the higher initial costs with lower operation and maintenance expenses. The intent is to give designers an incentive to implement sustainable ideas into potential new facilities. It also highlights the interdependence of economic and environmental goals.

Time is also a constraining factor in sustainability implementation. Every construction project has a schedule that must be met. Including sustainable construction requires additional time for A/E selection, product and process opportunities and vendor research. Sustainable

construction will not necessarily add time to the construction phase but rather the design phase. Some designers feel that sustainable construction adds time to their design practices the first time they implement it but after that it becomes much easier. In other words, sustainability initially adds time to the design process due to the lack of availability of information. As sustainable construction education grows among the engineering community, building developers, occupants and maintainers, resources will become more readily available.

Resources

A major complaint from designers, construction contractors, and customers is that there are thousands of environmentally friendly ideas available, but no one knows exactly where to find them or how to implement them. It is like the recycling bin. If it is next to the trashcan, the average consumer will probably recycle a soda can. If the recycling bin is inconvenient, the consumer may throw the can in the trash. The Air Force Center for Environmental Excellence (AFCEE) has created a guide to educate and make sustainable practices more accessible. Although this guide targets the Military Construction (MILCON) Process, the guide can be understood and implemented by a wider audience to educate everyone from top leadership to airmen on how to implement sustainability in everyday practices. The guide allows the user to find information on specific areas of construction, such as indoor air quality, waste management, or building materials. Used as a tool, the guide can also enable planners, designers, project managers, energy managers, environmental managers, A/E consultants and constructors to work on schedule and within the budget, while conserving and providing safe and healthy environments for people. Working on schedule and within a budget in a way that conserves resources clearly illustrates the interdependency of economic and environmental goals. To incorporate the entire Air Force team into the practices of sustainable construction, the guide will be available on AFCEE's website.



Figure 1: The Sustainable "Green" Construction Web Page www.afcee.brooks.af.mil

The Sustainable "Green" Construction website, as seen in figure 1, answers questions about sustainable construction, how to employ it, and examples of sustainability throughout the military. It allows the user to find sustainable construction information conveniently and discover how to go about the implementation process. The web page also offers the user easily accessible resources. For example, the Green Construction Website has a resources "toolbox" that links the user to resources they need to implement sustainable construction practices. These

resources include everything from military documents available at the base level to engineering technical letters and computer software sources. These resources allow the user to find information through the Internet without randomly searching for information on sustainable construction and thereby saving time. The U.S. Air Force Environmentally Responsible Facilities Guide along with the Green Construction website are examples of resources available in order to conveniently implement sustainable construction.

Sustainable construction is cost effective in the long-term, increasingly convenient to implement, and is gaining support in the military and in the civilian construction communities. Designers, contractors, customers and the general public can benefit from sustainable construction. Considering the entire life cycle of a building and its components, as well as the economic and environmental impact and performance, is the key to sustainable construction. The convenient availability of high quality information on and resources for sustainable construction can increase its visibility and its implementation in a variety of military and civilian contracts. It has been said that "we do not inherit the earth from our parents, we borrow it from our children." Sustainable construction is a way to move towards protecting and preserving the environment for tomorrow.

Works Cited

- Browning, William D. and Romm, Joseph J. Greening the building and the Bottom Line: Increasing Productivity through Energy-Efficient Design. U.S Department of Energy and the Rocky Mountain Institute, 1994.
- HOK: Hellmuth, Obata & Kassabaum Inc. "Special Report: HOK Sustainable Design Roundtable." Sustainable Design. Spring 1998.
- National Commission on the Environment. Choosing a Sustainable Future. Washington: Island Press, 1993.
- Roodman, David Malin. A Building Revolution: How Ecology & Health Concerns are Transforming Construction. Washington D.C.: World Watch Institute, 1995.